404-CD-001-003

EOSDIS Core System Project

Procedure for Control of Unscheduled Activities During Verification for the ECS Project

April 1996

Hughes Information Technology Systems
Upper Marlboro, Maryland

Procedure for
Control of Unscheduled Activities
During Verification for the ECS Project

April 1996

Prepared Under Contract NAS5-60000
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SUBMITTED BY

Robert E. Clinard /s/ 4/4/96

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EOSDIS Core System Project

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Preface

This document, as a formal contract deliverable with an approval code 1, required Government review and approval prior to acceptance and use. It was reviewed and approved, with comments, per GSFC Code 505 contracts letter dated January 22, 1996. Comments received with the approval letter have been incorporated, and this document is now considered accepted for use; no further review is required. Future changes to this document shall be made by document change notice (DCN) or by complete revision. Any future changes must be reviewed and approved by the Government.

This document is under ECS Project Configuration Control. Any questions or proposed changes should be addressed to:

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Abstract

This document provides guidance to test personnel for the handling of certain anomalies that occur during planned test activities. This document is limited to a description of those procedures that are adhered to following an unanticipated interruption in the execution of a planned Integration and Test or Acceptance Test session. It describes the process for recognition, identification, resolution and documentation of unscheduled activities occurring during the verification process.

Keywords: verification, testing, nonconformance, test, procedures, acceptance test, integration test, I&T

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Change Information Page

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iii through xi	Submitted as Final
1-1 and 1-2	Submitted as Final
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1. Introduction

1.1 Identification

This document is the Procedure for the Control of Unscheduled Activities During Verification. It is submitted as required by Data Item Description (DID) 404/VE1 for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Contract (NAS5-60000).

1.2 Scope

The procedures specified in this document are applicable to Release Integration & Test (I&T) and Independent Acceptance Test Organization (IATO) activities for the ECS. The roles, relationships, and methodologies of the Release I&T and IATO test organizations are detailed in the Verification Plan for the ECS Project (194-401-VE1-002). Release I&T activities include the incremental integration of ECS components at the ECS Development Facility (EDF). Release I&T will verify level 3 and 4 functional requirements utilizing a build/thread methodology. ECS Acceptance Testing will be performed by the IATO at each of the ECS sites on fully configured ECS installations. IATO testing will execute realistic operational scenarios to verify level 3 functional and performance requirements and overall system operability. This document details the procedures to be followed by each of the two test groups when the planned course of test execution is interrupted by unscheduled and unexpected occurrences.

This document reflects the February 14, 1996 Technical Baseline maintained by the ECS Configuration Control Board in accordance with the ECS Technical Direction No. 11, dated December 6, 1994.

1.3 Purpose

The purpose of this document is to establish procedures for controlling, documenting, and approving all unscheduled activities that occur during the execution of Release I&T and IATO test procedures. For the purpose of this document, unexpected occurrences are any anomalies or events that interrupt the planned execution of test procedures or prevent the continuation of testing. Such occurrences include critical system performance anomalies; hardware, communications or power failures; or critical errors in the design or execution of test procedures. This document specifies a process by which the decision to proceed with testing can be made so as to minimize the impact on the flow of the overall verification process.

1.4 Status and Schedule

This Final version is submitted with the intent that it be approved and placed under the control of the ECS Change Control Board (CCB) for submission to the Goddard Space Flight Center (GSFC) as an approval code 1 document.

This submission is being made co-incident with the Release B Critical Design Review (CDR) although the procedures contained herein are applicable to all releases.

1.5 Organization

The contents of this document are organized as follows:

Section 1 Introduction - Introduces the scope, purpose, status, schedule, and document organization.

Section 2 Related Documentation - Provides a bibliography of reference documents organized by parent document, applicable document, and information document subsections.

Section 3 ECS Contractor Verification Overview - Provides a brief summary of the Release I&T and IATO activities and the organization and roles of the test team.

Section 4 Controlling, Documenting, and Approving Unscheduled Activities - Contains the detailed instructions for handling unscheduled occurrences encountered during the execution of test procedures. The process is defined by the details of this section along with the processes described in the following ECS program instructions:

SD-1-014 Software Nonconformance Reporting and Corrective Action System Process, ECS Project Instruction

CM-1-025 Software Development Handbook, ECS Project Instruction.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this Procedure for Control of Unscheduled Activities During Verification's scope and content are derived:

420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-03	Goddard Space Flight Center, Contract Data Requirements Document for the EOSDIS Core System (ECS)

2.2 Applicable Documents

The following documents are referenced within this Procedure for Control of Unscheduled Activities During Verification, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

319-CD-001-003 402-CD-004-001	Flight Operations Segment (FOS) System and Segment Integration and Test Plan for the ECS Project
319-CD-004-003	CSMS Integration and Test Plan for the ECS Project, Volume 2: Release A
319-CD-005-002	SDPS Integration and Test Plan for the ECS Project, Volume 2: Release A
322-CD-001-002 414-CD-001-002	Interim Release 1 Integration and Test Plan and Procedures for the ECS Project
194-401-VE1-002	Verification Plan for the ECS Project
402-CD-001-002	System Integration and Test Plan for ECS Project for Interim Release 1
402-CD-002-002	System Integration and Test Plan for the ECS Project, Volume 2: Release A, Final
402-CD-003-001 319-CD-006-001	Release B System and Segment Integration and Test Plan for the ECS

409-CD-001-004	ECS Overall Acceptance Test Plan for Release-A
409-CD-002-001	ECS Overall Acceptance Test Plan for Release-B

2.3 Information Documents

The following documents are referenced herein and amplify or clarify the information presented in this document. These documents are not binding on the content of the ECS Procedure for the Control of Unscheduled Activities During Verification.

403-CD-001-002	Verification Specification for the ECS Project
403-CD-002-001	Release B Verification Specification for the ECS Project
194-415-VE1-002	Acceptance Testing Management Plan for the ECS Project

3. ECS Contractor Verification Overview

This section is a brief summary of the responsibilities and activities of the ECS Release I&T and IATO verification organizations. A more detailed discussion of this information can be found in the Verification Plan for the ECS Project. Detailed discussions of the plans and procedures for the verification of each of the ECS Releases are contained in the respective test plans and test procedures documents generated by Release I&T and IATO.

3.1 Verification Program Summary

The test program for the ECS Project is described in the Verification Plan for the ECS Project as a series of tests with ever widening scope culminating in the ECS Overall Acceptance Test. Each test activity has a life cycle consisting of test planning, procedure generation, test conduct, and completion events. Table 3-1 lists the documents and events that mark these life cycle phases for Release I&T and IATO verification activity.

Table 3-1. Verification Life Cycle Phases

Life Cycle Phase	RELEASE I&T	IATO
Test Planning	Segment and System Integration & Test Plans	ECS Overall Acceptance Test Plans
Procedure Development	Segment and System Integration & Test Procedures	ECS Overall Acceptance Test Procedures, General and Site-Specific Volumes
Test Conduct Initiation Event	Test Readiness Review (TRR)	Consent to Ship Review (CSR)
Test Conduct Completion Event	Consent to Ship Review (CSR) Segment and System Integration & Test Report	Release Readiness Review (RRR) Acceptance Test Report

3.2 Test Team Organization

Both Release I&T and IATO assign a test manager to coordinate and manage verification activity. They also provide test conductors to manage the execution of the step-by-step procedures that are defined in the test procedures documents for integration and acceptance testing. Test conductors also write, collect, and track Nonconformance Reports (NCRs) and determine the impact of these reports on test plans, scenarios, test cases, and procedures.

In all, five testing positions are used in verifying the ECS: test participants, test witnesses, test monitors, test conductor, and test manager.

- Test Participants. Individuals who execute the test session. They include test team members, existing computer operators, and other personnel who perform activities related to test conduct, as well as personnel at other facilities that support ECS testing. Each participant is responsible for reviewing the status of materials under his or her control and for reporting this status to the test conductor prior to the start of the test session.
- Test Witnesses. Individuals required or invited to directly observe test conduct to verify compliance with requirements. They may include the Government personnel, Independent Validation and Verification (IV&V) personnel, Quality Office, and others. Witnesses do not participate directly in the test activities of a test session. The test manager or test conductor as appropriate, is the witnesses' point of contact while a test session is in progress.
- Test Monitors. Individuals who review test data, materials, results, and documentation, but need not be physically present during test conduct.
- Test Conductor. Responsible for all activities associated with a test session and directs test conduct in all respects. Prior to the test session, the test conductor schedules the required test resources, including equipment and facilities; verifies the schedule and notifies participants of any changes; and ensures that the required test materials are complete. The test conductor, in consultation with the test manager (if applicable), schedules and chairs the pretest briefing and assigns follow-up actions as required to ensure that all is ready prior to the test session. During the test session, the test conductor establishes and verifies the system configuration, assigning specific roles to test participants and directing the sequence of events. The test conductor is also responsible for ensuring that all necessary validation activities have been completed. When all test activities are complete, the test conductor coordinates an orderly shutdown of the test system, supervises collection of output and other test materials, and conducts the post-test briefing. The test conductor is responsible for directing problem resolution when test execution is interrupted by unexpected problems.
- Test Manager. Chairs the overall testing activity to ensure that the objectives are clear and to coordinate the sequence of activities with the test conductor. If no test manager is scheduled or present, the test conductor performs the required tasks.

3.3 Test Conduct

Test conduct is the execution of the approved test procedures in the officially approved and controlled test configuration. For Release I&T, test conduct takes place in the ECS Development Facility (EDF) on functional components integrated into the test baseline according to the plan approved at the TRR. IATO test conduct will take place at each of the ECS operational sites on fully approved and configured release baselines as approved at the CSR.

3.3.1 Test Direction

All formal tests are conducted under the direction of the Test Conductor who has direct authority regarding all aspects of the execution of that test. The test conductor leads the response to unexpected events encountered during testing. He evaluates the impact of the interruption,

prioritizes problem resolution, and plans, schedules, and coordinates the corrective response. The test conductor's authority includes the assignment of priority to NCRs, NCR disposition, and the NCR's impact on ongoing testing. The step-by-step details of nonconformance reporting and software configuration management is described in the Software Nonconformance Reporting and Corrective Action System Process Project Instruction (SD-1-014) and the Software Development Handbook Project Instruction (CM-1-025).

Authority is vested in the Test Conductor by the Project or Release Manager, but may be further delegated at specific times (off-shift) and/or sites or during his absence. At the EDF, the Test Conductor authority will be delegated as needed on a shift basis to a key member of the Release I&T team. During Release I&T the test conductor will have more immediate access to the I&T Office for guidance. For the final Acceptance Test, where activities will involve more than one site, this delegation of authority is key. The local test conductor needs autonomy, but also needs centralized guidance. For further information concerning duties of other test participants, see the Verification Plan (DID 401/VE1).

3.3.2 Test Schedule Management

The Test Conductor is responsible for the scheduling and dispatch of test resources and activities. In consultation with concerned parties, he/she determines what portion of the test will be executed on a given day. During this process all pertinent factors are examined: availability of system resources, conflicts with other activities and inherent test sequencing concerns. The test procedure is the most basic increment of test preparation and execution. Test procedures may be grouped into sequences or build/threads. It is crucial that the Test Conductor be cognizant of dependencies within the test structure (e.g., does The current test procedure require that another procedure has run successfully to establish initial data conditions?). These are documented in the test procedure itself, but the Test Conductor must have broader understanding and control of the test environment at all times to deal effectively with unexpected occurrences during testing.

When a given test is scheduled for execution, the Test Conductor ensures that all necessary materials and supporting data are present. Included and key to this activity are copies of the applicable procedures, either hard copy or access to on-line soft copy. Specially labeled copies of the procedures will be distributed to each participant actually performing the test. Observers will receive copies so they may follow the execution. The copies of the test procedures held by those performing the test and the Test Conductor's copy will be collected and become part of the official record of the test. As such, on the day of the test they will be marked, by hand, to indicate date, time, operator position (or role) and who is using the procedure.

Before the beginning of a scheduled test period a pre-test meeting will be held by the Test Conductor. The frequency of pre-test meetings will be dependent on the type of testing being performed (Release I&T or IATO) and the circumstances of the particular test period. The Test Conductor will determine the need for both regularly scheduled and Ad Hoc meetings. The purpose of the pre-test meetings will be to:

a. Brief the activities to be performed

b. Assess readiness to proceed with those activities

c. Discuss any special conditions for the conduct of the activity

d. Apply any last minute markups to the test procedures to be used. If there are any, they will be made, initialed and dated.

All changes to test procedures, either during planning, execution, or post test analysis, must be approved and initialed by the Test Conductor. Changes to test procedures will be either temporary or permanent. Temporary changes are those that are made to accommodate a singular event or circumstance. Temporary changes will generally apply to only one execution of the test procedure and will be made to document the deviation for reporting purposes. For temporary changes the procedures will be marked up in blue or black ink. Permanent procedure changes are made to correct errors in the procedures or insert new steps which will be executed every time the test is re-run. Permanent changes will be marked up in red ink and will be reflected in the next document release which contains that particular test procedure.

3.3.3 Test Execution

The test will begin under the control of the Test Conductor or a designated authority. Team participants will follow, exactly, the instructions written in the procedures. The instructions will specify test participant inputs to the system under test as well as the use and coordination of test tools, simulators, and external data interfaces. In some cases these procedures will have an inherent timeline that is critical to the success of the activity. In these cases the procedures will have, for each step or group of steps, a time tag telling when they should be performed. The Test Conductor will coordinate the pacing of these steps by providing synchronized time sources to all participants. In other cases, the procedures will have self-contained pacing instructions. These may instruct the test participant to wait until directed to proceed with a given activity.

The test procedures will specify what data is to be collected as the test is executed. This may include spaces where data is to be entered into the procedure itself to capture results or to record the time it took to perform a given activity. All entries requested must be entered in blue or black ink.

3.3.4 Unscheduled Events During Test Execution

If problems are encountered which interrupt or prevent the execution of the test procedures, the procedures in Section 4 are to be followed. In this context problems might include the following:

a. Failure of the system to perform as specified in the procedure.

b. Inability to perform the next step due to, for instance, missing data. An example is: "Select an ASTER image dated 9/11/98".

c. Critical software failure.

d. Hardware, communications, or special test equipment failure.

e. Loss or unavailability of a required external system or interface.

f. An error in following the procedure. Steps might be inadvertently skipped. This may be noticed by the operator or might cause a more overt problem already listed above.

g. Unexpected actions by others that affect the test environment.

It is the responsibility of the test participants to determine if problems have occurred. If there is doubt they will immediately address their concerns to the Test Conductor. The Test Conductor is, likewise, responsible to carefully follow the conduct of the test constantly, looking for deviations or anomalies.

3.3.5 Test Conduct Documentation

As the test proceeds, significant events will be recorded in test logs. Each test team participant will keep a log. The Test Conductor will keep a master test log which will include the information recorded in the individual logs.

Upon completion of a session of testing, the Test Conductor will direct the securing of all necessary information. Depending on the formality of the test, materials may be impounded by a third party (typically the Quality Office). Material to be collected/controlled includes:

a. All test procedures (including markups)

b. Test Logs (including individual logs and notes and the master test log)

c. Materials produced by the system under test including printouts, screen dumps, and logs and reports from test tools such as Xrunner and Loadrunner.

d. Post test file dumps. This may involve collection of actual media to perform the saves. If instead, the dumps are recorded on disk, they should be placed under CM control by saving them within the ClearCase tool. In this case, a record of the data set names and version must be maintained.

e. NCRs written during the testing period. Note: Some problems encountered are obvious NCRs and can be written immediately. Other problems are discussed at the post test review meeting described below. ECS policy is to write NCRs freely and dispose of duplicates or erroneous submissions after review.

3.3.6 Daily Test Reviews

At the completion of each day of testing, a post test review meeting is held to review the events of the day. If testing involves simultaneous activities at multiple sites, as in the IATO end-to-end scenarios, this post test review meeting will be held as a teleconference. During this meeting, overall testing status will be assessed. Problems encountered during the day will be reviewed. This will be accomplished by reviewing all test procedures and test logs. Each problem will be discussed and assessed. A determination of the need to create a Nonconformance Report will be made. If an NCR is opened, a team member will be assigned to enter it in the Nonconformance Reporting and Corrective Action (NCRA) system. The status and priority of the problem will be determined, if possible. Any necessary follow-up investigation will be assigned including imposition of a due date. A daily log of statistics will be kept citing the number of test cases executed, number of Nonconformance Reports filed, their classification and other test metrics for status reporting purposes. Specific metrics relating to test execution will be developed, reviewed, and approved prior to the start of test conduct activities.

Finally, a determination of success for the day's activities will be made and discussed. This will guide the planning for the next session's activities. Based on this assessment, any changes in the scheduled activities for the next day will be evaluated and the test schedules and procedures updated appropriately. Generally, complete success in meeting the objectives for a day's testing will result in the uninterrupted continuation of the planned test activities. Unexpected interruptions to testing will result in the rescheduling of test activities and resources to minimize the impact to the testing effort. Section 4 describes the procedures for handling specific types of unscheduled activity.

4. Controlling, Documenting and Approving Unscheduled Activities

Unscheduled activities are actions that must be undertaken in reaction to an unexpected event that prevents the execution of the steps specified in a test procedure. Unexpected events or anomalies can be the result of:

a. Nonconformance of the product under test which stops test execution

b. Operator errors in following the test procedure or use of incorrect data

c. Errors in the test procedure not detected during review or rehearsal

d. External influences such as an inadvertent change to a piece of test hardware by someone not involved in the test or unavailability of an external interface

e. Failure of a portion of the supporting infrastructure such as a hardware or network failure

The impact of an unscheduled activity may range from noting the failure in the test log and continuing the test to the total cessation of test activities. The purpose of this section is to document procedures that can be executed immediately upon the onset of an unexpected occurrence during verification. The following major goals have been considered in planning for the management of these occurrences :

a. Act decisively and quickly to prevent wasted time and effort

b. Accurately and completely document the unscheduled activity to allow further, after the fact, analysis should it be necessary

c. Attempt to preserve the test schedule and prevent duplicative effort by continuing testing where valid results can be obtained.

The following sections describe the general approach to be taken in performing unscheduled activity and specific actions to be taken based on the characteristics of the unexpected event.

4.1 Unscheduled Activity Procedures

The subsections that follow define the general step-by-step process to be used when an unscheduled activity occurs during system-level Release I&T and IATO testing. The primary actions to be taken include rapid identification and escalation of the problem, initial assessment of the severity and criticality of the problem, documentation of the problem occurrence, detailed analysis of the problem impact and candidate solutions, documentation of actions taken, and review and follow-up of the activity. The procedures as stated are to be applied during both Release I&T and IATO testing except where test organization-specific procedures are specified. Section 4.2 discusses actions to be taken in response to specific categories of problems.

4.1.1 Detection and Notification

When any test team member determines or is suspicious that an anomalous event has occurred, the Test Conductor must be immediately notified. If proximity allows, the notification should be verbal. If not, the telephone or other immediate, on-line methods should be used. The test team member noticing the problem documents the problem in his/her individual test log recording the time of the occurrence and the detailed indications of the problem. The Test Conductor logs the notification in the master test log noting the source and time of occurrence. During IATO multi-site testing, all involved site test teams are notified of the event.

4.1.2 Initial Assessment

The Test Conductor has the responsibility to immediately assess the seriousness of the anomaly. The Test Conductor examines the context of the problem and decide its effect on the rest of the test sequence being performed by consulting the test procedures.

If there are no interdependencies or critical test sequence issues, testing may be allowed to continue while the problem undergoes further analysis and work-around generation. Generally these types of problems are isolated events that do not corrupt data required for subsequent testing or events that can be easily recovered from by re-establishing the correct test configuration and re-executing the test procedures.

If there are interdependencies or significant questions about the validity of any continued testing, the Test Conductor immediately pauses the entire test execution pending additional investigation. Typical events that may require such action would include system anomalies that result in invalid or corrupt information being stored by the system, system failures or processing anomalies that prevent further execution of the test procedures, situations where the steps in the test procedures do not map to the observed system operational interface or functional performance, or the unavailability of critical resources or external interfaces.

4.1.3 Documenting the Problem

The Test Conductor polls the test team members to collect the details of the unexpected occurrence. These are collected in the Master Test Log. The master test procedure is annotated to indicate where in the test the problem occurred. It is critically important that accurate, complete information be obtained and labeled for retention and analysis. Special care must be taken with the following types of data to prevent their loss:

a. UNIX *core* files - Produced by the error termination of a process. Usually produced in the directory from which the process was initiated. The file contains useful information in diagnosing the problem. These files must be located and renamed promptly to prevent overwriting should another problem occur.

b. Display Screen Outputs - The exact error indication must be recorded to insure accurate analysis. This is accomplished by carefully recording the output in the test log or by obtaining screen dumps.

c. Log Files - Log files are created at various levels within the system including the UNIX operating system, the COTS and the ECS application. Often the greatest problem is in

correlating the information across the various logs. This is facilitated by careful notation of time of occurrence. After a problem occurs, it is important to capture and retain all log files for later analysis.

Copies of all information gathered are assembled in a folder and prepared as a possible attachment for any NCRs that might be generated to document the problem. An Unscheduled Event Report (UER) must be filled out (see Appendix A) to document the unscheduled activity. The purpose of the UER is to focus the investigation into the cause and impact of the unscheduled event and to provide a means to track and control all actions taken in response. The UER is not intended to replace the NCR nor inhibit the generation of NCRs. The Test Conductor will record details about the event and the actions taken on the UER. The UER will be attached to any NCRs written in response to the event and will be included in the formal Test Report. Likewise, the NCRs will be referenced on the UER form.

4.1.4 Detailed Assessment and Response

After gathering additional information about the unexpected occurrence, the Test Conductor is responsible for ensuring that a detailed assessment of the problem is performed. This is done to determine the validity of the initial assessment and to review and approve actions to be taken. As a result of the new information it may be determined that it is necessary to abandon the current test session and restart to preserve test integrity. Again, it is important that this be done decisively and in a timely manner to prevent wasted effort by the larger test team.

It is necessary to document any and all actions taken after the unscheduled occurrence takes place because they are deviations from the procedure as written. All such deviations are recorded in the test logs (master and individual). Additionally, the test procedures must be marked up to control and record the actions of team members. Blue or black ink are used to record any temporary changes made to the test procedures. Red ink is used to indicate any permanent changes required. All procedure markups, test logs, and supporting documentation are included in the formal Test Report to be delivered at the conclusion of the test phase. Some possible procedure deviations that may be made in the event of an unexpected occurrence are:

a. It may be necessary to repeat a section of the procedure. The steps repeated are noted in blue or black.

b. New steps, unique to the occurrence may be necessary to work-around a problem or previous error. These are written into the procedure in blue or black.

c. A special test may be performed to gather additional information for problem resolution or to support the secondary assessment process described above. Depending on the length of the exercise, this may be noted in the procedures in blue or black ink or the steps taken may be entered in the test logs with the point of their execution marked in the procedure in blue or black (i.e. where in the sequence of steps was the special test performed?).

d. A correction to the procedures themselves may be necessary if their deficiency caused the problem in the first place. The corrections are made to the procedure in red ink.

e. A portion of the procedure may be skipped entirely for this test execution with the intent that it be executed at a later date. The extent of the skipped portion is marked clearly in the procedure in blue or black ink.

For all procedures that may re-used in future testing, the Test Conductor and the Quality Office will review the as-executed procedures to ensure that the procedure changes are reflected in the baseline test procedure documents. In the case of IATO testing, a separate procedures volume exists for each test site. If the procedures change or work around applies to tests to be executed at sites other than where the problem was originally found, those procedure volumes must be updated accordingly.

4.1.5 Reviewing the Unscheduled Activity

At the post test briefing for the session, all unscheduled activities are reviewed with the entire team. Test logs and procedures are reviewed during the discussion to provide information and to be sure that everything was captured in the record of the test.

With the completion of the day's activity, it is possible to make a final determination of the validity of the actions taken as a result of the initial and detailed assessment of the event. The Test Conductor, with the participation of the test team, must finally decide the value of the test session as a whole by insuring that the recovery actions taken did not invalidate the rest of the test results. Additionally, it will be at this meeting that an initial determination is made as to whether baseline documentation changes are required.

As with all post test meetings, all anomalies are examined to determine if Nonconformance Reports need to be written as described in the Software Nonconformance Reporting and Corrective Action System Process Project Instruction. In the event that the unscheduled activity has the potential to seriously impact the testing schedule or affect the integrity of the test, the problem is elevated to the appropriate level. For Release I&T, the Release Manager is formally notified of any schedule or technical risks resulting from the event. During IATO testing, the Government Representative, the Release Manager, and the Contractor Project Manager are notified of critical unscheduled events.

4.2 Controlling Unexpected Events

Unexpected events that interrupt testing activities can be categorized into three levels of severity, each of which will require an appropriate level of response. These levels are:

a. Singular, transient interruptions

b. Problems which can be corrected in the test environment without configuration changes

c. Problems which require changes to the baseline under test

Figure 4-1 shows the decision process which must be put into action immediately upon the detection of an unscheduled event during a test. The following subsections further describe the actions to be taken in response to these event categories.

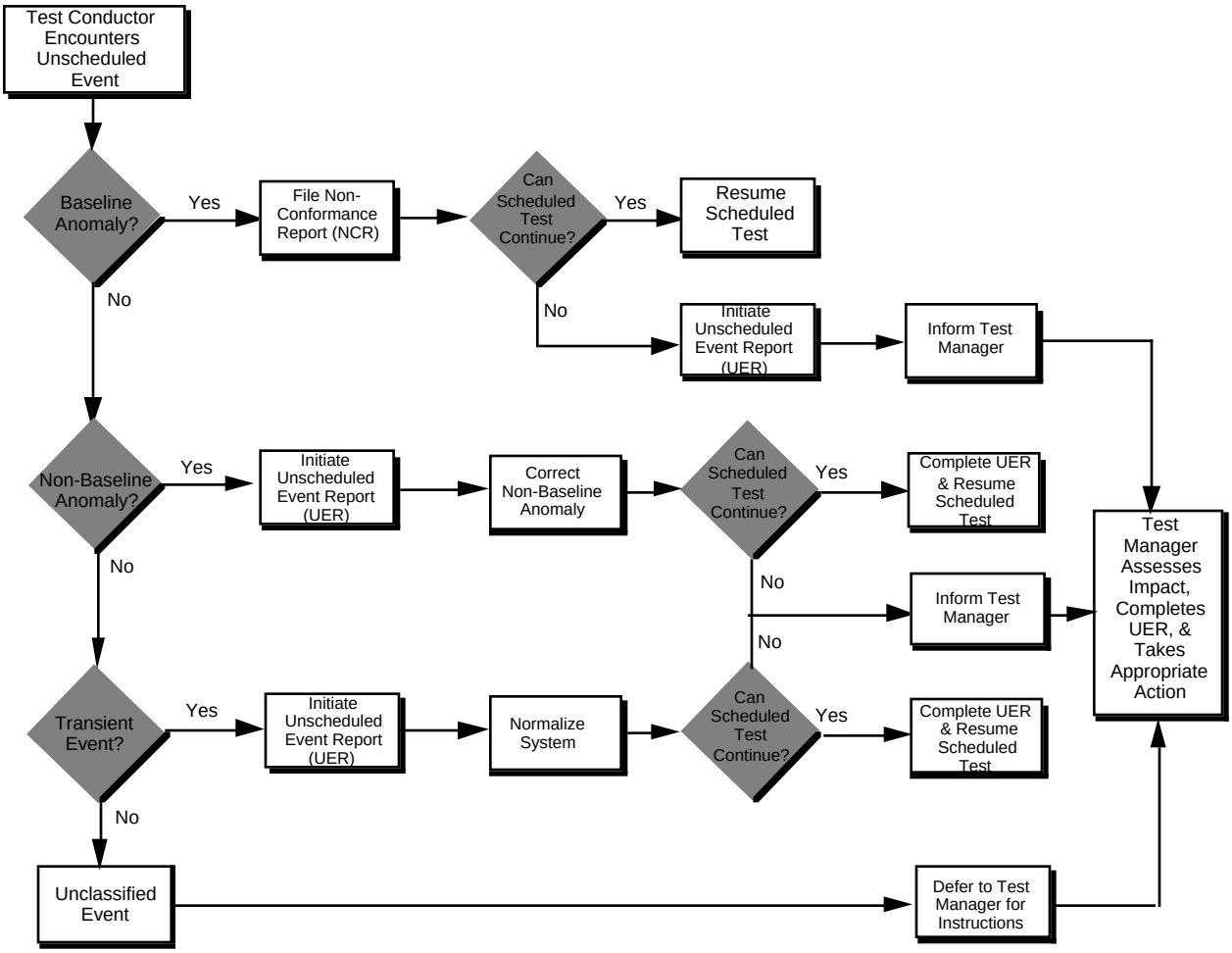

Figure 4-1. Unscheduled Event Disposition Process

4.2.1 Transient Interruptions

Singular, transient interruptions are events which disrupt the execution of test procedures but are not the result of anomalies in the system under test or in the test procedures. Events of this nature will include power failures, operator input errors, or loss of connectivity with internal and external interfaces. Transient events would also include interruptions due to higher priority activities requiring system resources or a facility emergency requiring the cessation of testing. Transient events do not require any change to the test baseline or procedures.

For both Release I&T and IATO testing, the action to be taken upon the occurrence of such an event will be to re-initialize the test environment to the test procedure starting condition and to re-execute the procedure. Information about the interruption and the steps taken to restart testing is to be recorded in the master test log, and a UER will be generated.

A special case of transient interruption, the unavailability or failure of external systems or interfaces requires the test conductor to ensure that the use of external systems and protocols for

problem resolution are coordinated well in advance of the test period. During testing, a point of contact for each participating external system will be established. At the occurrence of external interface interruption, the test conductor will plan and execute the most effective response in coordination with the point of contact for the external system.

4.2.2 Anomalies in Non-Baselined Test Items

Problems which can be corrected in the test environment without requiring change to the baseline of the system under test include unexpected events caused by incorrect setup of the test environment, use of incorrect input data, misconfiguration of databases or system parameters, or errors in the test procedures. This type of problem can be corrected by the test team or support personnel without generating an NCR against the component under test or making changes to components under configuration control.

For both Release I&T and IATO testing, the test team acts to correct the problem as quickly as possible and restart the test procedure. No action is taken until the test conductor determines that the assessment of the cause of the problem is correct and that the planned action for correcting the problem will be effective without compromising the integrity of the test. Once this determination is made, the planned correction is implemented. If the problem is an error in the test procedures, the procedures are corrected using red ink. A full description of the problem and corrective actions are recorded in the master test log, and a UER is be generated. The interrupted test procedure is re-initialized and restarted. In some cases, additional testing steps may be inserted into the test procedure to validate the correctness of the action taken to correct the problem.

4.2.3 Anomalies in Baselined Items

Anomalies or failures in the system under test which prevent the execution of test procedures may require a formal configuration change before the interrupted test can be re-executed. Such anomalies will generally be caused by errors in the software code, design, or configuration or errors in the baselined hardware or communications environment. If the test team's assessment determines that the test interruption is most likely caused by such a problem, an emergency NCR or trouble ticket is written against the component under test, the NCR or trouble ticket number is recorded in the test log, a UER is generated, and the execution of the test procedure ceases. The problem is brought to the immediate attention of the Release Manager and the Change Control Board (CCB) which has jurisdiction over the baseline under test.

For Release I&T testing, the problem is brought to the attention of the Release CCB which has the authority to approve changes to the release components under system integration and test. For Acceptance Testing, the ECS Contractor CCB is the CM authority for baseline changes. For both testing organizations, the Test Conductor examines the testing schedule to identify test scenarios, sequences, or procedures that are not affected by the problem or dependent upon the completion of the interrupted procedure. The Test Conductor reschedules testing activities to minimize the impact to the testing schedule while waiting for the correction to be delivered by the developers.

Once the correction is installed in the baseline via a formal Configuration Change Request (CCR) or the failed component is repaired or replaced via the trouble ticket, the interrupted test procedure is re-initialized and restarted. It will usually be necessary to re-execute other test cases in the scenario to verify the correction produced no negative side effects.

4.3 Disposition of Unresolved Problems

Some problems in the test baseline will be unresolved. These problems are anomalies in the baseline under test which cannot be corrected within the time frame of the testing schedule. Such problems will generally be the result of hardware components or COTS products that cannot meet functional or performance requirements, or significant design problems in the system under test. If the test team determines that such a problem has been detected, an NCR is written, a UER is generated, and testing of the failed component ceases. Other test scenarios may be executed as described above. It may also occur that a problem will be determined to be unresolvable by the development organization during the analysis of an NCR submitted by the test organization.

If the Release I&T Test Conductor determines that testing cannot be performed on the failed component, a memo describing the problem and its impact is written and delivered to the Release Manager for resolution. If the IATO testing encounters such a problem, the IATO Test Conductor informs, via memo, the test Government Representative, the Release Manager, and the ECS Contractor Project Manager.

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Appendix A - ECS Unscheduled Event Report

ECS Unscheduled Event Report		
Control Number :	Date:	Time:
Originator:		
Testing Organization: (RELEASE I&T/IATO) Test: Test Plan ID _____ Test Procedure ID_____ NCR Ref._____		
Event Description:		
Action Taken:		
Rationale for Action:		
Impact Analysis: Schedule Impact: Test Impact:		
Approval: Witness:		
Test Conductor:		

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Abbreviations and Acronyms

CCB	Change Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CM	Configuration Management
CSR	Consent to Ship Review
DAAC	Distributed Active Archive Center
DID	Data Item Description
ECS	EOSDIS Core System
EDF	ECS Development Facility
EOC	EOS Operations Center
EOSDIS	Earth Observing System Data and Information System
GSFC	Goddard Space Flight Center
IATO	Independent Acceptance Test Organization
NCR	Nonconformance Report
NRCA	Nonconformance Reporting and Corrective Action (System)
RRR	Release Readiness Review
SI&T	System Integration & Test
SMC	System Monitoring and Coordination Center
UER	Unscheduled Event Report

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